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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/811,461 | 03/26/2004 | Marius K. Orlowski | SC13240TP | 1781 |

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| EXAMINER | |
|---|---|
| BOOTH, RICHARD A | |
| **ART UNIT** | **PAPER NUMBER** |
| 2812 | |

DATE MAILED: 01/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/811,461 | ORLOWSKI ET AL. | |
| | Examiner | Art Unit | |
| | Richard A. Booth | 2812 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *15 December 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-30* is/are pending in the application.

4a) Of the above claim(s) *1-15* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *16-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 16-17, 19, and 23-30 are rejected under 35 U.S.C. 102(e) as being anticipated by Mansoori et al., US 2005/0014353.

Mansoori et al. shows the invention as claimed including a method for forming a semiconductor device comprising: providing a substrate 1602 having a surface; forming an insulating layer 1604 over the surface of the substrate; forming a first patterned conductive layer 16610 over the insulating layer; forming a second patterned conductive layer over the first patterned conductive layer; forming a patterned non-insulating layer 1614 over the second patterned conductive layer; and selectively removing portions of the first and second patterned conductive layers to form a notched control electrode for the semiconductor device (see figs. 15-25 and paragraphs 0036-0061).

With respect to claim 17, note that the process further comprises implanting source/drain regions 1636/1638 in the substrate (see fig. 24).

Regarding claim 19, note that the patterned non-insulating layer is polysilicon.

Concerning claims 23-24, note that the second patterned conductive layer is silicon-germanium.

Regarding claim 25, Mansoori et al. teaches the use of aluminum oxide as a gate dielectric.

With respect to claims 26-27, note the process steps of: selectively etching a predetermined portion of an exposed lateral edge of the second patterned conductive layer; and oxidizing an exposed portion of the first patterned conductive layer to form a layer 1630,1632.

Regarding claims 28-29, note that the process further comprises forming a second insulating sidewall layer 1630,1632 in the notches and on the opposite sides of the notched control electrode.

Concerning claim 30, note that the length of the first and second conductive layes into the page will be substantially equal.

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein

were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mansoori et al., US 2005/0014353.

Mansoori et al. is applied as above but does not expressly disclose wherein the first patterned conductive layer is formed to a thickness of between 1 and 40 nanometers. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to determine through routine experimentation the optimum thickness of the first conductive layer based upon a variety of factors including the particular desired scaling of the semiconductor device and such limitation would not lend patentability to the instant application absent a showing of unexpected results.

Claims 18 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mansoori et al., US 2005/0014353 in view of Pidin et al., "A Notched Metal Gate MOSFET for sub-0.1 micron Operation".

Mansoori et al. is applied as above but does not expressly disclose forming a halo implant in the substrate or forming the first patterned conductive layer of a material such as titanium nitride.

Pidin et al. discloses a notched gate whereby a high concentration halo channel implant is performed in the substrate (see fig. 1) and the first conductive layer is formed of titanium nitride (see fig. 8). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Mansoori et al. so as to perform a halo implant and form the first conductive layer of titanium nitride because such an implant forms a MOSFET device with good electrical characteristics, and because a material such as titanium nitride is an excellent conductor to be used in gate formation.

Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mansoori et al., US 2005/0014353 in view of Gardner et al., U.S. Patent 6,225,168.

Mansoori et al. is applied as above but does not expressly disclose forming the first conductive layer of a material such as tungsten.

Gardner et al. discloses forming a gate with a first conductive material 209 which can be formed of tantalum nitride (see col. 3-lines 10-24). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Mansoori et al. so as to form the first conductive layer of tantalum nitride because this layer provides a good barrier for the gate electrode from the gate dielectric.

### *Response to Arguments*

Applicant's arguments filed 12/15/05 have been fully considered but they are not persuasive. Applicant argues that the limitation "selectively removing the first and second patterned layers..." is not shown in the Mansoori reference. However, note that the limitation is shown since a single process step can be broken up into an infinite number of smaller process steps and therefore this process step can be represented by an intermediate figure between figures 19 and 20. Concerning claim 30, note that although the widths of the first and second conductive layers will not be equal, the length represented by the dimension into the page will be substantially equal.

### *Conclusion*

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Richard A. Booth whose telephone number is (571) 272-1668. The examiner can normally be reached on Monday-Thursday from 7:30-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Lebentritt can be reached on (571) 272-1873. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Richard A. Booth
Primary Examiner
Art Unit 2812

January 9, 2006